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IMPROVEMENTS APPLIED TO CONTINUOUS LINEAR  
SQUARE-FITTING MACHINE USED IN THE MILLING  
PROCESS OF COCONUT ENDOCARP (*Cocos Nucifera L.*)

TECHNICAL FIELD

This present invention concerns improvements applied to continuous linear square-fitting machine used in the milling process of the coconut endocarp (*Coco nucifera L.*); more particularly it relates to improvements applied to said machine, which allows a right arrangement of threads of endocarp obtained during the milling process, keeping them aligned with the cutting knives, so that tablets from the coconut shell is obtained on the square, improving the applicability conditions of said tablets within the most variable kinds, such as furniture, automotive, building, and general decoration industries.

BACKGROUND OF THE INVENTION

As it is known, the coconut is the fruit of the coconut palm and is one of the largest nuts in the vegetal domain, being consisted of the epicarp – a smooth and viscous epidermis, the mesocarp – fibrous layer, and the endocarp – outer membrane, which is known by its feature of being a hard shell with loosen and tangled fibers.

The coconut, along the years, has reached high rates of good use, and its water under natural condition may be exploited or, further, may be industrially bottled, besides the processing of the pulp, coconut milk, rasped coconut, sweets, and a series of utilization of the coconut fiber, among other uses.

In order to expand the good use of the coconut, the applicant filed a Brazilian patent application No. PI 0002207 on May 2, 2000 – which

provided a milling process of the coconut endocarp, particularly the *Coco Nucifera L.* species, being this process comprised by a set of machines made of slicer and square-fitting machinery, which is effective enough to mould a half of the coconut endocarp, which is naturally concave/convex, into tablets of variable dimensions and shapes to be sold in bulk, or with multiple shapes and sizes. The first slicer machine mould the half of the coconut endocarp into threads of parallel sides, whilst the square-fitting machine mould the threads produced by the slicer machine into tablets.

The tablets may be shaped in different ways such as rhombus, rectangular, square, trapezoidal, hexagonal, round, triangular, heptagonal, octagonal and irregular. They further keep the original molecule structure of the endocarp and have an abrasive, mechanical and chemical resistance inherent to said original molecule structure. Side by side placed, they form plates which may be commercialized and applied to curve or irregular surfaces since their flexibility feature, besides they have various applications on objects like bottoms, handles, decoration in general, complementary clothing, etc.

Either in the slicing and square-fitting machines, cuts are automatically done in parallel and right angles, thus making certain the production of uniform tablets.

The operational system, indicated in the mentioned document, is assembled in such a way that the endocarps, reaching the production phase, may be half cut, being put in the conveyor belt. They are lead to a capture set, comprised of a tooth wheel and of a rubber wheel, fixing the endocarps to the first cut through parallel saws, generating a central thread and two end pieces which are taken and threw into a second capture set, producing new threads and thus successively, until all parts of the endocarp be cut in threads.

Said threads are taken and transferred to a square-fitting machine where they are captured by a endless screw thread that supplies a principal

flywheel comprised of inlets and a clinging system which fixes the threads in such a position that they are allowed to pass through the cut sets, thus producing the tablets. Every chip and powder resulting from the process are sold in bulk, in order to be used for other purposes.

As it may be understood from the above description, the invention process already applied for mainly intended the obtainment of tablets from the coconut endocarp, aiming to provide a new material dedicated to the coating of furniture pieces, decoration and building, among other equivalent applications.

As described, the process uses a machine named square-fitting machine, provided with cutting knives applied to as dimensional equalizers of the threads obtained subsequently to the slicing of the coconut endocarp, in order to provide uniform tablets.

However, during the development of the process, applicant noticed the need of constructively changing the machine, intending to simplify the arrangement of the threads before the slicing of the square-fitting machine knives, mainly in the portion whereby a longitudinal advancement of the threads occurs – and this, in the former machine, led to problems such as the gripping of the threads into the fastening system which consequently puts the regular ongoing course of the threads in a jam.

Another solved problem, as a consequence, is the fact that the duration of the stops for maintenance of the machinery was reduced, since the applied changes made the system much more simple, with only linear, continuous and circular motions, such as a transporting belt.

## BRIEF DESCRIPTION OF THE DRAWINGS

In order to complement the present description, so that a better understanding on the features of the present invention is obtained, and according to a preferred way of practical construction of the same, a set of

the attached drawings follows the description, whereby, through a simplified mode, it has been reached the below particulars:

Figure 1 is a side view of the continuous linear square-fitting machine, assembled right below the conveyor belt coming out from the slicer machine (not illustrated);

Figure 2 is a top view of the square-fitting machine and the assembly sequence of the conveyor chains;

Figure 3 is a scheming front view of the square-fitting machine, indicating the system of conveyor chains and the cutting system;

Figure 4 indicates a partial and enlarged detail of one of the conveyor chains, pointing out the leading teeth.

Figure 5 indicates a detailed view and a side perspective of the conveyor chain leading threads of the coconut endocarp to one of the cutting sections;

Figure 6 is a top view of the previous figure, and

Figure 7 indicates a serie of tablets aligned side-by-side, pointing out the square obtained through the innovated machine.

## DETAILED DESCRIPTION OF THE INVENTION

As regards to the illustrated drawings, the present invention relates to "IMPROVEMENTS APPLIED TO CONTINUOUS LINEAR SQUARE-FITTING MACHINE USED IN THE MILLING PROCESS OF COCONUT ENDOCARP (*Cocos Nucifera L.*), continuous linear square-fitting machine (1), particularly applied to the milling process of coconut endocarps, which were processed by a slicer machine (A) (not illustrated), producing threads (F) which are led to the square-fitting machine (1) through rolling conveyor belt (T); said square-fitting machine being used to produce tablets (P) on the square from the threads (F) of the coconut endocarp (figure 7).

In accordance with the present invention and with the figures 1 and 2, through a system of rolling conveyor belts (T), the threads (F) come close to the deposit (2) of the square-fitting machine (1), which is basically comprised by a metal structure (3) where a fixing and conveyor system (SF) is installed through conveyor fixing chains (4) and a cutting system (SC) by circular saws (5).

Before the tablets (F) passing through the first saw (5a), they are downwards compressed by a set of straps (10) and pulleys (12), guiding said threads to be exactly placed on the square; arrangement which is made possible due to the distribution of teeth (13), positioned in a spaced way and at 90° towards the chains (4); teeth which are preferred assembled by a pair of trapezoidal blades, fixed in the external faces of the links of the chains (4), guiding the threads (F) to be placed at 90° towards the teeth of the saw of the cutting knives (5).

The conveyor chains (4a) with teeth (13) will catch the threads (F) coming from the deposit (2) at a 90° position, making them to pass through the first double saws (5a), making the first cut (a), going to another set of chains (4b) with teeth (13) which will catch, at a 90° position, the lateral pieces of the threads (F) remained from the first cut (a), and leading them to the next set of saws (5b) making the second cut (b) and thus successively with the other conveyor chains (4c, 4d) and corresponding cutting saws (5c, 5d), effecting the subsequent cuts (c) and (d).

Figure 7 indicates, in detail, the tablets obtained through the continuous linear square-fitting machine; and, only for complementing purposes, the powder generated from the cutting production may be mixed to natural or synthetic resins and to other sawing powder generated through the processing of other kind of coconut, such as *Babassu*, *Dendê* and even the chip of the coconut, also resulting from the same process.

Despite the detailed invention, it is important to state that the same does not limit the applicability to the details and phases herein

described. The invention is subject to other modalities and to being put into practice or executed in a variety of ways. It must be understood that the terminology herein used simply aims the description, not the limitation.